REMARKS

The Office Action dated May 12, 2003 has been received and carefully studied.

The Examiner continues to reject claim 15 under 35 U.S.C. §102(b) as being anticipated by Nakano et al., EP 0541124 A2. The Examiner notes that claim 15 does not include the limitation that the plurality of studs are provided in the center area of the separator sheet.

By the accompanying amendment, claim 15 has been amended to recite that the studs are present in the center area of the separator sheet.

The Examiner newly rejects claims 1-4, 6, 7 and 11-15 under 35 U.S.C. §102(b) as being anticipated by Böhnstedt, U.S. Patent No. 5,776,630. The Examiner states that Böhnstedt teaches separators for use in accumulators having longitudinal and transverse ribs, both of which being located in the center area of the separator, with the longitudinal ribs being continuous and having both a round and an angular (truncated) cross section with equal-sided trapezoidal sections being preferred.

By the accompanying amendment, claims 1, 13 and 15 have been amended by reciting that the studs are shaped as spherical caps, semi-spheres, truncated pyramids, truncated cones or non-continuous ribs having a length of not more than 0.5 cm. Support for the amendment can be found at page 6, last full paragraph, to page 7, line 5. Claims 1, 13 and 15 also have been amended to recite at least one elongated continuous rib. Support for the amendment can be found at page 5, last paragraph of the specification.

Böhnstedt discloses a separator having longitudinal and transverse ribs for use in accumulators. The transverse ribs of Böhnstedt have a length of at least 8 mm (column 2, line 35), since the transverse ribs fill the gap between two longitudinal ribs where are spaced apart 8 to 15 mm. Thus, Böhnstedt does not disclose or suggest a plurality of studs shaped as spherical caps, semi-spheres, truncated pyramides, truncated cones, or non-continuous ribs having a length of not more than 0.5

cm as now recited in the instant claims.

The Examiner maintains the rejection of claims 1-7 and 11-15 under 35 U.S.C. §103(a) as being unpatentable over Knauer, U.S. Patent No. 5,558,952 in view of Grimes.

The rejection is respectfully traversed.

Knauer teaches pocket separators for lead acid storage batteries which do not show the disadvantages of the prior art, namely, the disadvantages associated with vertical ribs, such as misalignment of electrode plates and slow production (column 1, lines 37-42). According to Knauer, these problems are solved by separators which comprise a plurality of continuous vertical ribs, a plurality of broken inclined ribs at the side edges, and a plurality of broken vertical ribs in the center which engage the positive or negative plate of the electrode (column 1, lines 53-57).

The Examiner states that Knauer does not specify where the continuous vertical ribs are located, and states that Knauer suggests the continuous vertical ribs may be located anywhere on the separator sheet. Applicants respectfully but vigorously disagree. Knauer explicitly and repeatedly indicates that the vertical ribs are only found at the side edges of the separator sheet. Thus, with reference to Figures 1 to 3, Knauer states:

> "The sheets **10** at the right and left side edges **12** and **14** are provided with a plurality of spaced vertical ribs **15**, five being illustrated, which run lengthwise along the sheets **10** and are continuous." (Emphasis added.)

Column 2, lines 58-61. Knauer further states at column 2, lines 62-64:

> "Inside of the ribs **15**, a plurality of short ribs **17** are provided at the right side **12**, and a plurality of short ribs **18** at the left side **14**." (Emphasis added.)

Thus, according to Knauer, the separators are provided with a plurality of inclined ribs at the side edges and a plurality of continuous vertical ribs which are arranged outside of the inclined ribs, i.e.,

at the very outside edges of the separator sheet. This is also evident from claim 1, according to which a plurality of continuous vertical ribs is joined together at the side edges of the pocket (column 4, lines 16-17). Accordingly, Knauer expressly specifies where the continuous vertical ribs are located and makes it very clear that they must be located at the side margins of the separator sheet.

In view of the foregoing, applicants respectfully submit that regardless of the teachings of Grimes, the skilled artisan would not be motivated to modify the Knauer separator by locating the continuous vertical ribs of Knauer in the center area of the separator, since Knauer explicitly requires that the continuous vertical ribs be located at the side edges of the separator.

In response to Applicants' contention that in view of Knauer's intention to avoid the disadvantages associated with vertical ribs which are arranged in the middle area of the separator sheet, one skilled in the art would not have been motivated to modify the separators of Knauer by providing vertical ribs in the center area of the separators as in Grimes, the Examiner states that it is important to note that the disadvantage of misalignment discussed by Knauer is only applicable when the negative electrode plate is inserted into the pocket separator. However, the disadvantages of misalignment discussed by Knauer are not only found when the negative plate is inserted into the pocket separator. Although the separators of Knauer are said to be particularly useful for enveloped negative plates (column 3, lines 2-5), pocketing of the positive plates is not excluded and is still within the teachings of Knauer. According to Knauer, misalignment is caused by the vertical ribs of the separator catching the edges of the electrode plates (column 1, lines 40-42). In the prior art considered by Knauer, the negative electrode plate is pocketed and then combined with positive electrode plates. Since separator ribs usually face the positive electrode plates in order to avoid direct contact of the separator sheet with the highly oxidizing positive electrode, the ribs are located at the outside of the pocket and misalignment is observed when combining the pocketed negative plates with

the positive plates. If, on the other hand, the positive electrode is pocketed, the ribs will be located on the inside of the pocket and misalignment will be observed during the pocketing step.

Grimes et al. describes separators for zinc-bromide batteries. This battery type is -- if used in the automotive industry at all -- intended to be used as a vehicle propulsion battery (traction battery), e.g., in electric cars. Those skilled in the art appreciate that the requirements of such batteries are completely different from the requirements of lead acid batteries, which are used as starter batteries for cars. For instance, zinc-bromide batteries cannot provide fast cold start properties which are needed to start a car, since zinc-bromide batteries must first be activated by circulating the electrolyte before they can provide electric energy. Since the functioning of zinc-bromide batteries is very different from lead-acid batteries, and since the separators used are intimately involved in that functioning, the skilled artisan would not be motivated to combine the teachings of Grimes et al. with that of Knauer. Indeed, as shown in Figure 1 of Grimes et al., zinc-bromine batteries comprise two separate compartments comprising two different electrolytes which are separately circulated through the battery (Figure 1 and column 4, lines 6-18). The separators used in this system are sheet separators comprising a microporous sheet provided with a non-porous frame (column 5, lines 1-4). Thus, the separators of Grimes et al. are not compatible with the pocket design of Knauer and, therefore, one skilled in the art would not look to Grimes et al. to modify Knauer, and would not be motivated to modify Knauer in any way.

In this connection, the Examiner states that Grimes "at the least, suggests the separators may be used in lead acid batteries". Applicant respectfully requests that the Examiner point out where such a suggestion is made. Applicants respectfully submit that Grimes et al. nowhere mentions lead acid batteries and nowhere suggests that the disclosed separators possibly could be used in such batteries.

Moreover, in the unlikely event that a skilled artisan combined the teachings of Knauer and Grimes et al., the result would be the modification of the Knauer separator based upon the selection of a separator design which is compatible with the object of Knauer to avoid the disadvantages associated with vertical ribs in the center area of a separator sheet. Thus, the separator design as shown in Figure 7b of Grimes et al., which greatly resembles the separator design of Knauer, would be selected, and would not lead to the instant invention as claimed.

The allowability of claim 8 is noted with appreciation.

Reconsideration and allowance are respectfully requested in view of the foregoing amendment and remarks.

Respectfully submitted,

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Listing of Claims

1. (Currently amended) A pocket battery separator for a lead-acid storage battery having a useful life, said separator comprising a microporous sheet ~~made of~~ comprising synthetic resin having a center area and side areas and being provided with a plurality of studs in the center area of at least a first side of the sheet, characterized in that the separator additionally comprises at least one elongated continuous vertical rib in the center area of at least said first side of the sheet provided with a plurality of studs, said at least one elongated continuous vertical rib and said plurality of studs remaining on said sheet during said useful life, said studs having a shape selected from the group consisting of spherical caps, semi-spheres, truncated pyramides, truncated cones and non-continuous ribs having a length of nor more than 0.5 cm.

2. (Cancelled)

3. (Original) The separator as defined in claim 1 comprising 2 to 4 elongated vertical ribs in the center area of the separator sheet.

4. (Cancelled)

5. (Previously presented) The separator as defined in claim 1 wherein said at least one elongated vertical rib has the same or a lower height than the studs.

6. (Previously presented) The separator as defined in claim 1 wherein said at least one elongated vertical rib has the same or a lower height than the studs.

7. (Original) The separator as defined in claim 1 wherein the studs and the ribs are solid bodies integrally formed of the same material as the separator sheet.

8. (Previously presented) The separator as defined in claim 1 wherein the ribs are formed of a different material than the separator sheet.

9. (Cancelled)

10. (Cancelled)

11. (Previously presented) The separator of claim 1 in which the studs and vertical ribs are provided on the inner surface of the pocket.

12. (Previously presented) The separator of claim 1 wherein the at least one elongated rib is arranged in the bottom edge area of the separator pocket.

13. (Currently amended) A rolled-up battery separator for a storage battery having a useful life, said separator comprising a porous sheet having a center area and side areas and being provided with a plurality of studs on at least a first side of the sheet, characterized in that the separator additionally comprises at least one elongated continuous vertical rib in the center area of at least said first side of the sheet provided with a plurality of studs, said plurality of studs and said at least one elongated vertical rib remaining on said sheet during said useful life, said studs having a shape selected from the group consisting of spherical caps, semi-spheres, truncated pyramides, truncated cones and non-continuous ribs having a length of nor more than 0.5 cm, said separator being adapted to be cut into pieces for insertion in said storage battery.

14. (Original) A lead acid storage battery comprising at least one separator according to claim 1.

15. (Currently amended) A pocket battery separator for a lead-acid storage battery, said separator being a microporous sheet consisting essentially of a homogeneous mixture of 8 to 100 vol.% polyolefin, 0 to 40 vol% plasticizer and 0 to 92 vol.% ~~insert~~ inert filler, said sheet having a center area and side areas and being provided with a plurality of studs in the center area of ~~on~~ at least a first side of the sheet, characterized in that the separator additionally comprises at least one elongated continuous vertical rib in the center area of at least said first side of the sheet provided with a plurality of studs, said studs having a shape selected from the group consisting of spherical caps,

semi-spheres, truncated pyramides, truncated cones and non-continuous ribs having a length of not more than 0.5 cm.